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10/783,295	02/19/2004	Jesus A. Dominguez	KSC-12278	6127

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EXAMINER

KRASNIC, BERNARD

ART UNIT	PAPER NUMBER
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2624

MAIL DATE	DELIVERY MODE
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07/19/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/783,295	Applicant(s) DOMINGUEZ ET AL.	
	Examiner Bernard Krasnic	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>2-19-2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Reference character "108" in Fig. 2.

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 1, 6, 8, 10, 12, 17, 19, and 21 are objected to because of the following informalities:

Claims 1 and 8, line 6, claims 12 and 19, line 7 respectively: "application carrying out the steps of" should be -- application comprising the steps of --.

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Claims 6 and 10, line 1, claims 17 and 21, lines 1-2 respectively: "wherein each of said input" should be -- wherein each of said input --.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

3. Claims 1-22 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 1-22 are drawn to functional descriptive material NOT claimed as residing on a computer readable medium. MPEP

2106.IV.B.1(a) (Functional Descriptive Material) states:

"Data structures not claimed as embodied in a computer-readable medium are descriptive material per se and are not statutory because they are not capable of causing functional change in the computer."

"Such claimed data structures do not define any structural or functional interrelationships between the data structure and other claimed aspects of the invention which permit the data structure's functionality to be realized."

Claims 1-22, while defining a "computer-based method" or a "computer system" and an "application", does not define a "computer-readable medium" and is thus non-statutory for that reasons. A "computer-based method" or a "computer system" and an "application" can range from paper on which the program is written, to a program simply contemplated and memorized by a person. The examiner suggests amending the claims to embody the program on "computer-readable medium" in order to make the claims statutory.

"In contrast, a claimed computer-readable medium encoded with the data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory."
- MPEP 2106.IV.B.1(a)

Also, Claims 1-22 are drawn to functional descriptive material (i.e., "data structures and computer programs which impart functionality when employed as a computer component" at MPEP 2106.IV.B(1)). However, the program/algorithm itself merely manipulates data or an abstract idea, or merely solves a mathematical problem without a limitation to a practical application in the technological arts. MPEP 2106.IV.B.2(a) (Statutory Product Claims) states:

"A claim limited to a ... manufacture, which has a practical application in the technological arts, is statutory."

In order for a claimed invention to accomplish a practical application, it must produce a "useful, concrete and tangible result" *State Street*, 149 F.3d at 1373, 47 USPQ2d at 1601-02 (see MPEP 2106.II.A). Currently, the claims do not recite a practical application. In order for the claimed product to produce a "useful, concrete and tangible" result, recitation of one or more of the following elements is suggested:

- 1 The manipulation of data that represents a physical object or activity transformed from outside the computer (MPEP 2106 IVB2(b)(i)).
- 2 A physical transformations outside the computer, for example in the form of pre or post computer processing activity (MPEP 2106 IVB2(b)(i)).
- 3 A direct recitation of a practical application in the technological arts (MPEP 2106 IVB2(b)(ii)).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Khamy ("A fuzzy gradient-adaptive lossy predictive coding technique" – IEEE – March 2003) in view of Takahashi (US 6,665,439 B1) and Meitzler et al (US 6,424,736 B1).

Re Claim 1: Khamy discloses a computer-based method for detecting one or more edges / edge prediction in a multiple pixel digital image / gray scale still image (see Section IV. CONCLUSIONS, paragraph 1, lines 1-3, abstract, lines 1-2) comprising the steps of providing a multiple pixel digital gray scale image / gray scale image to be analyzed / edge prediction in an operating memory of a computer (see Section IV. CONCLUSIONS, paragraph 1, lines 1-3, abstract, section I. INTRODUCTION, paragraph 1, coding and compression of a digital image is well known in the art at the time the invention was made to be accomplished with the use of computers and their different RAM, memory, cache and processor components); analyzing / prediction said image for edges with an image edge detection application / edge prediction, said application carrying out the steps of 1) selecting a pixel / current pixel with neighborhood in said image to be analyzed (see section II. THE PROPOSED CODING SYSTEM, A. Adaptive Fuzzy Prediction Scheme, paragraph 1, prediction values for a current pixel with a local neighborhood are extrapolated); 2) identifying an edge path / horizontal edge, vertical edge, 45 degree edge, and 135 degree edge which passes through said selected pixel / current pixel (see section II. THE PROPOSED CODING SYSTEM, A. Adaptive Fuzzy Prediction Scheme, paragraph 1, there are four different

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edge paths); 3) calculating an average pixel intensity gradient value / four first order directional gradient for said edge path (see section II. THE PROPOSED CODING SYSTEM, A. Adaptive Fuzzy Prediction Scheme, paragraph 3 "Where α and δ are positive constants ...", the four first order directional gradient values are calculated for the current pixel, see equations 11-14); 4) using said average pixel intensity gradient value as an input to a fuzzy membership function / fuzzy membership functions and generating with said function, a plurality of output values that are related to a degree / low [no edge], medium [weak edge], high [strong edge] to which said pixel represents an edge in said image (see A. Adaptive Fuzzy Prediction Scheme, paragraph 2, equations 6-9 and 15, the gradient values are inputted into the fuzzy membership functions and a final fuzzy prediction value is determined using the fuzzy functions, also see Fig. 3, section B.2. Maximum Entropy-Based Fuzzy Gradient Classification Algorithm, paragraph 1, the local gradient value is used to determine in which class of the three fuzzy classes the current pixel belongs to); and 6) repeating steps (1)-(5) for additional pixels in said image (see section II. THE PROPOSED CODING SYSTEM, the steps are repeated for all the pixels going from current pixel to next current pixel for maximal coding purposes).

However, Khamy fails to specifically disclose or fairly suggest in step 3) calculating an average pixel intensity gradient value for said edge path by comparing a gray level intensity of pixels on one side of said edge path to a gray level intensity of pixels on an opposite side of said edge; and step 5) combining said plurality of output

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values using a weighted averaging analysis to assign a crisp edginess value to said pixel.

Takahashi discloses 3) calculating an average pixel intensity gradient value / edge strength for said edge path [the calculating for the gradient value is also taught by Khamy above] by comparing a gray level intensity of pixels on one side of said edge path to a gray level intensity of pixels on an opposite side of said edge (see Figs. 6A-6D, these four 3x3 edge template windows having one side of the template positive while having the other side negative produces a determination of the gradient strength for each specific orientation of horizontal direction, 45 degree direction, vertical direction, and 135 degree direction, this positive and negative sides results in a calculation of a difference between two sides which gives value to the gradient strength for the specific orientation).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Khamy's method using Takahashi's teachings by including to Khamy's gradient value calculation the specific gradient determination scheme of using edge template formats to determine the gradient strength value for the different specific edge orientations in order to improve the gradient strength value determination (see Takahashi, col. 14, lines 29-31).

However, Khamy as modified by Takahashi still fails to specifically disclose or fairly suggest the step 5) combining said plurality of output values using a weighted averaging analysis to assign a crisp edginess value to said pixel.

Meitzler discloses step 5) combining said plurality of output values using a weighted averaging analysis / centroid averaging to assign a crisp edginess value / crisp value to said pixel (see col. 2, lines 27-31).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Khamy's method, as modified by Takahashi, using Meitzler's teachings by including to Khamy's fuzzy predictor the step of applying the fuzzy rules and membership functions results to a centroid averaging for defuzzification in order to obtain a crisp value for further usable target detection design choices (see Meitzler, col. 2, lines 27-31).

Although Khamy fails to specifically disclose an operating memory of a computer, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have such a feature because Khamy's teaching of coding and compression of a digital image is well known to be accomplished with the use of computers and their different RAM, memory, cache, processor, and other computer components.

Re Claim 2: Takahashi further discloses identifying a plurality of different edge paths / horizontal edge, 45 degree edge, vertical edge, and 135 degree edge which pass through said pixel (see Takahashi, Figs. 6A-6D) [Khamy also discloses the edge paths as discussed in claim 1]; and, calculating an average pixel intensity gradient value / edge strength for each of said edge paths (see Figs. 6A-6D, these four 3x3 edge template windows having one side of the template positive while having the other side

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negative produces a determination of the gradient edge strength for each specific orientation of horizontal direction, 45 degree direction, vertical direction, and 135 degree direction, this positive and negative sides results in a calculation of a difference between two sides which gives value to the gradient strength for the specific orientation) [Khamy also discloses calculating an average pixel intensity gradient value for each edge path as discussed in claim 1]; selecting the greatest average pixel intensity gradient / largest edge strength (see Takahashi, Figs. 6A-6D, col. 14, lines 29-31 and 35-38) as input to said fuzzy membership function [Khamy discloses applying the gradient as input to the fuzzy membership function as discussed in claim 1].

Re Claim 3: Khamy further discloses four edge paths / horizontal edge, vertical edge, 45 degree edge, and 135 degree edge are identified that pass through said pixel / current pixel (see section II. THE PROPOSED CODING SYSTEM, A. Adaptive Fuzzy Prediction Scheme, paragraph 1, there are four different edge paths).

Re Claim 4: Takahashi further discloses wherein said average pixel intensity gradient value / edge strength is calculated by selecting an $n \times n$ pixel window / 3×3 window, where n is an odd number greater than or equal, to 3 and said pixel / current or object pixel to be analyzed is located at a center of said window; calculating a first, average pixel intensity value of pixels in said window on a first side of said edge path; calculating a second, average pixel intensity value of pixels in said window on a second, opposite side of said edge path; and, calculating a difference between said first and second

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values to obtain said average pixel intensity gradient value (see Figs. 6A-6D, these four 3x3 edge template windows having one side of the template positive while having the other side negative produces a determination of the gradient edge strength for each specific orientation of horizontal direction, 45 degree direction, vertical direction, and 135 degree direction, this positive and negative sides results in a calculation of a difference between two sides which gives value to the gradient strength for the specific orientation).

Re Claim 5: Khamy further discloses employing an input membership function / fuzzy membership functions to generate a plurality of input values relating said average pixel intensity gradient value to a plurality of degrees of intensity / low, medium and high (see Fig. 3, B.2. Maximum Entropy-Based Fuzzy Gradient Classification Algorithm); applying a plurality of inference rules in an output membership function that relate the plurality of intensity degrees / low, medium and high to a corresponding plurality of edginess degrees / no edge, weak edge, strong edge and thereby generate said plurality of output values (see Fig. 3, B.2. Maximum Entropy-Based Fuzzy Gradient Classification Algorithm).

Re Claim 6: Khamy further discloses wherein each of said input values / low, medium and high, inference rules and output values / no edge, weak edge and strong edge are employed; said input values being small / small, medium / medium and large / high; said output values being no edge / no edge, mild edge / weak edge and edge / strong edge;

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and said inference rules being if the average pixel intensity gradient value is small / low local gradient, the pixel is no edge / no edge; if the average pixel intensity gradient value is medium / medium local gradient, the pixel is a mild edge / weak edge; and, if the average pixel intensity gradient value is large / high local gradient, the pixel is an edge / strong edge (see Fig. 3, B.2. Maximum Entropy-Based Fuzzy Gradient Classification Algorithm).

Re Claim 7: Meitzler further discloses wherein said weighted averaging analysis is selected from the group consisting of an averaging union of truncated output singletons or a centroid averaging analysis / centroid averaging (see col. 2, lines 27-31).

Re Claim 8: Khamy discloses a computer-based method for detecting one or more edges / edge prediction in a multiple pixel digital image / gray scale still image (see Section IV. CONCLUSIONS, paragraph 1, lines 1-3, abstract, lines 1-2) comprising the steps of providing a multiple pixel digital gray scale image / gray scale image to be analyzed / edge prediction in an operating memory of a computer (see Section IV. CONCLUSIONS, paragraph 1, lines 1-3, abstract, section I. INTRODUCTION, paragraph 1, coding and compression of a digital image is well known in the art at the time the invention was made to be accomplished with the use of computers and their different RAM, memory, cache and processor components); analyzing / prediction said image for edges with an image edge detection application / edge prediction, said application carrying out the steps of 1) selecting a pixel / current pixel with

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neighborhood in said image to be analyzed (see section II. THE PROPOSED CODING SYSTEM, A. Adaptive Fuzzy Prediction Scheme, paragraph 1, prediction values for a current pixel with a local neighborhood are extrapolated); 2) selecting a window (see Fig. 2); 3) identifying a plurality of edge paths / horizontal edge, vertical edge, 45 degree edge, and 135 degree edge (see section II. THE PROPOSED CODING SYSTEM, A. Adaptive Fuzzy Prediction Scheme, paragraph 1, there are four different edge paths); 4) for each of said edge paths, calculating an average pixel intensity gradient value / four first order directional gradient for each said edge path (see section II. THE PROPOSED CODING SYSTEM, A. Adaptive Fuzzy Prediction Scheme, paragraph 3 "Where alpha and delta are positive constants ...", the four first order directional gradient values are calculated for the current pixel, see equations 11-14); 5) selecting said average pixel intensity gradient values as an input to an input fuzzy membership function / fuzzy membership functions to generate a plurality of input values relating said average pixel intensity gradient value to a plurality of degrees / low, medium, and high of intensity (see A. Adaptive Fuzzy Prediction Scheme, paragraph 2, equations 6-9 and 15, the gradient values are inputted into the fuzzy membership functions and a final fuzzy prediction value is determined using the fuzzy functions, also see Fig. 3, section B.2. Maximum Entropy-Based Fuzzy Gradient Classification Algorithm, paragraph 1, the local gradient value is used to determine in which class of the three fuzzy classes the current pixel belongs to); 6) applying a plurality of inference rules in an output membership function that relate the plurality of intensity degrees / low, medium and high to a corresponding plurality of edginess degrees / no edge, weak edge, and strong edge

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and generate a plurality of output values that are related to a degree to which said center pixel represents an edge in said image (see Fig. 3, B.2. Maximum Entropy-Based Fuzzy Gradient Classification Algorithm); and, 8) repeating steps (1)-(7) for additional pixels in said image (see section II. THE PROPOSED CODING SYSTEM, the steps are repeated for all the pixels going from current pixel to next current pixel for maximal coding purposes).

However, Khamy fails to specifically disclose or fairly suggest in step 2) selecting an $n \times n$ pixel window, where n is an odd number greater than or equal to 3 and said window includes a center pixel, wherein said center pixel is said pixel to be analyzed; and in step 3) edge paths run through center pixel and divide said window into first and second groups of pixels; and in step 4) calculating a first, average pixel intensity value of pixels in said first group and a second, average pixel intensity value of pixels in said second group; and, calculating a difference between said first and second values to obtain an average pixel intensity gradient value for each said edge path; and in step 5) selecting the greatest of said average pixel intensity gradient values and in step 7) combining said plurality of output values using a weighted averaging analysis to assign a crisp edginess value to said center pixel.

Takahashi discloses in step 2) selecting an $n \times n$ pixel window / 3×3 window, where n is an odd number greater than or equal to 3 and said window includes a center pixel / current or object pixel, wherein said center pixel is said pixel to be analyzed; and in step 3) edge paths / horizontal direction, 45 degree direction, vertical direction, and 135 degree direction run through center pixel and divide said window into first and

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second groups of pixels (see Figs. 6A-6D, these four 3x3 edge template windows having one side of the template positive while having the other side negative produces a determination of the gradient strength for each specific orientation of horizontal direction, 45 degree direction, vertical direction, and 135 degree direction, this positive and negative sides results in a calculation of a difference between two sides which gives value to the gradient strength for the specific orientation); and in step 4) calculating a first, average pixel intensity value of pixels in said first group and a second, average pixel intensity value of pixels in said second group; and, calculating a difference between said first and second values to obtain an average pixel intensity gradient value / edge strength for each said edge path (see Figs. 6A-6D, these four 3x3 edge template windows having one side of the template positive while having the other side negative produces a determination of the gradient strength for each specific orientation of horizontal direction, 45 degree direction, vertical direction, and 135 degree direction, this positive and negative sides results in a calculation of a difference between two sides which gives value to the gradient strength for the specific orientation); and in step 5) selecting the greatest / largest of said average pixel intensity gradient values / edge strength (see Figs. 6A-6D, col. 14, lines 29-31 and 35-38).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Khamy's method using Takahashi's teachings by including to Khamy's gradient value calculation the specific gradient determination scheme of using edge template formats to determine the gradient strength value for the

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different specific edge orientations in order to improve the gradient strength value determination (see Takahashi, col. 14, lines 29-31).

However, Khamy as modified by Takahashi still fails to specifically disclose or fairly suggest in step 7) combining said plurality of output values using a weighted averaging analysis to assign a crisp edginess value to said center pixel.

Meitzler discloses step 7) combining said plurality of output values using a weighted averaging analysis / centroid averaging to assign a crisp edginess value / crisp value to said pixel (see col. 2, lines 27-31).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Khamy's method, as modified by Takahashi, using Meitzler's teachings by including to Khamy's fuzzy predictor the step of applying the fuzzy rules and membership functions results to a centroid averaging for defuzzification in order to obtain a crisp value for further usable target detection design choices (see Meitzler, col. 2, lines 27-31).

Although Khamy fails to specifically disclose an operating memory of a computer, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have such a feature because Khamy's teaching of coding and compression of a digital image is well known to be accomplished with the use of computers and their different RAM, memory, cache, processor, and other computer components.

As to claims 9, the discussions are addressed with respect to claim 3.

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As to claims 10-11, the discussions are addressed with respect to claims 6-7.

As to claims 13-14, the discussions are addressed with respect to claims 2-3.

As to claim 12, the claim is the corresponding computer system claim to claim 1 respectively. The discussions are addressed with regard to claim 1.

As to claim 19, the claim is the corresponding computer system claim to claim 8 respectively. The discussions are addressed with regard to claim 8.

As to claims 15-18, the discussions are addressed with respect to claims 4-7.

As to claims 20 and 21-22, the discussions are addressed with respect to claims 3 and 6-7.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. JP8-329252 discloses an edge detection method for image processing which involves computing auxiliary data, which corresponds to edge direction, and gradient.

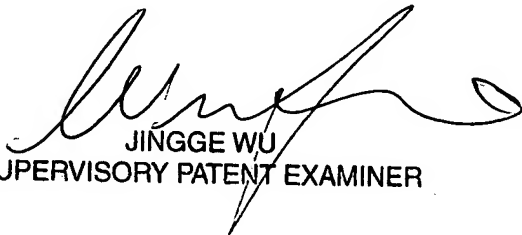
7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard Krasnic whose telephone number is (571) 270-1357. The examiner can normally be reached on Mon-Thur 8:00am-4:00pm and every other Friday 8:00am-3:00pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571) 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Bernard Krasnic
July 3, 2007


JINGGE WU
SUPERVISORY PATENT EXAMINER